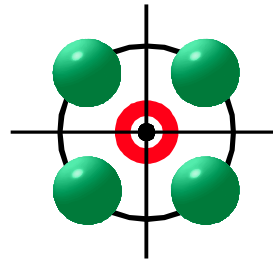**Systems Engineering & Supportability**
Conference & Workshop

Model Based Test Generation
for Software Systems

Brian Miller
Teradyne Software & Systems Test
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TestMaster is Deployed in a Wide Range of Telecom Companies:

Lucent	Ericsson
Nortel	AT&T
Motorola	Bellcore (SAIC)

… and these Mil/Aero Organizations:

F16 Fire Control Computer:
SAIC - Advanced Integration & Test Facility
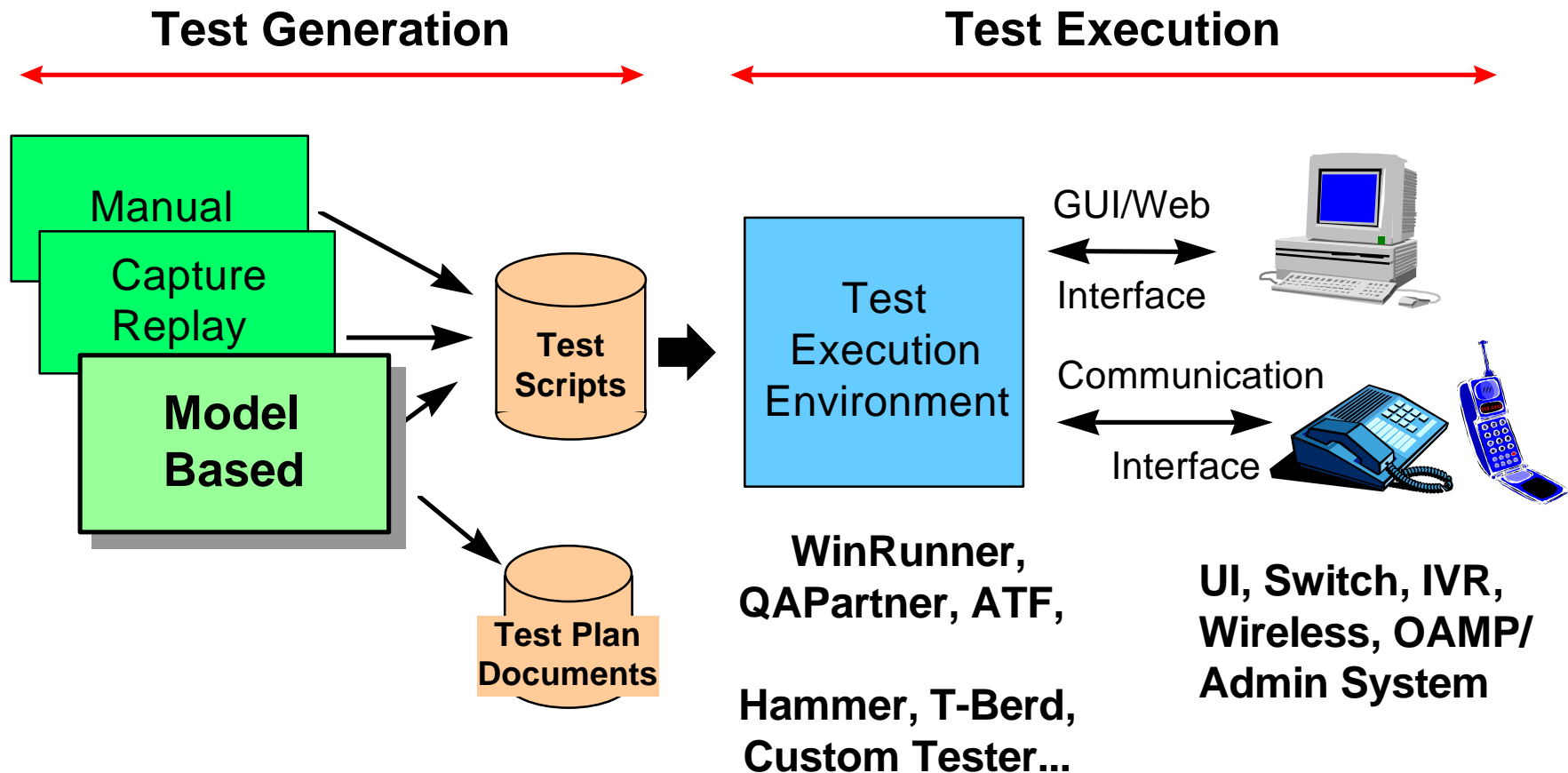Wright Labs

F15 Radar - PIVT Program:
Raytheon (Hughes Radar) & Warner-Robins

Jet Propulsion Labs - Image Processing

TERADYNE
Software & Systems Test

The Telecom Industry Characteristics that Drove TestMaster's Acceptance include:

- **Need for high quality/reliability systems**

- **Process-focused software development methodology**

- **Fast response to change in specifications**

TERADYNE
Software & Systems Test

Testing has Two Phases: Generation and Execution

Test Generation

Test Execution

Manual

Capture Replay

Model Based

Test Scripts

Test Plan Documents

Test Execution Environment

GUI/Web

Interface

Communication

Interface

WinRunner, QAPartner, ATF,

Hammer, T-Berd, Custom Tester...

UI, Switch, IVR, Wireless, OAMP/ Admin System

TERADYNE
Software & Systems Test

A Behavioral Model Defines the Use of a System at One or More of its Interfaces
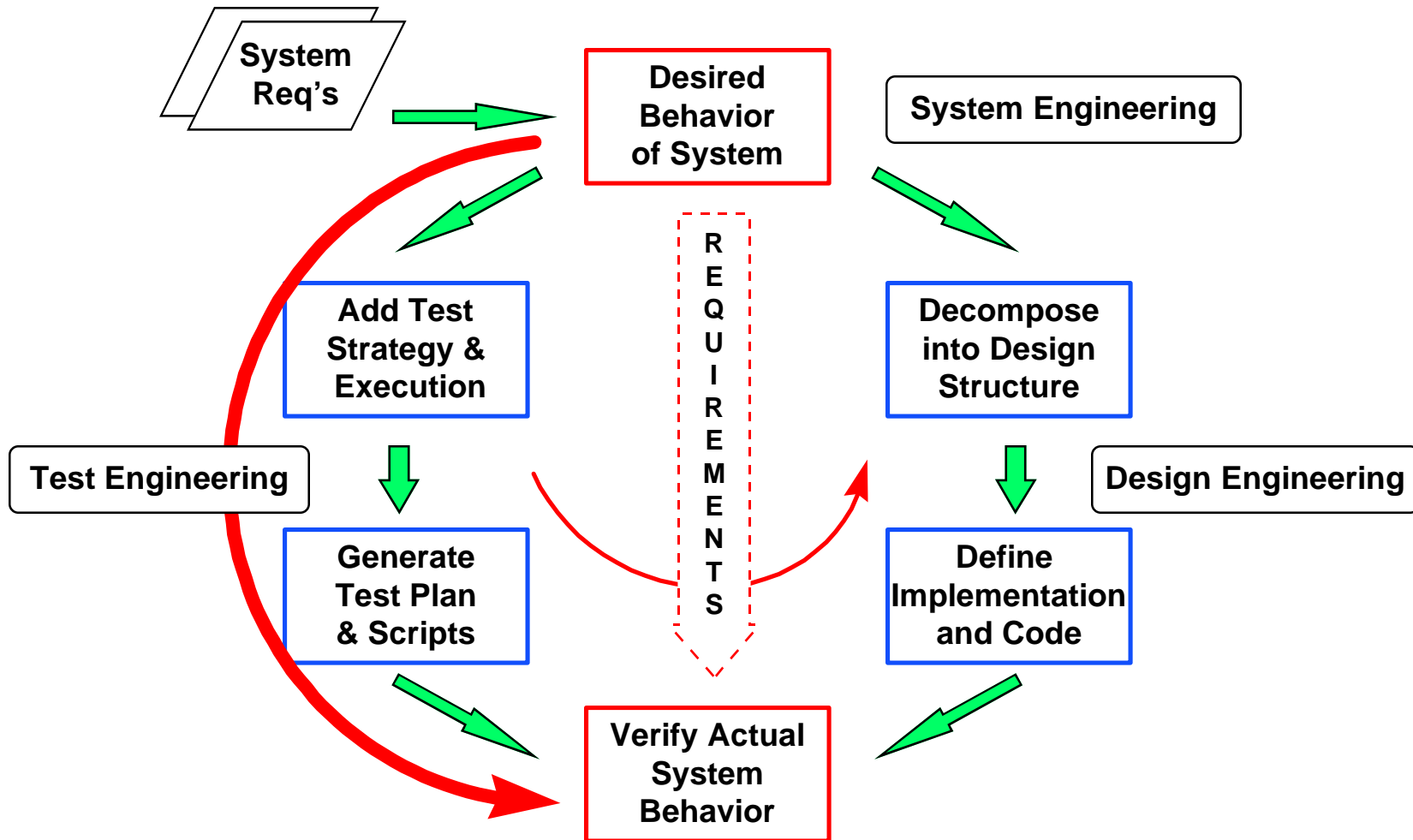
Start with typical use cases, focus on the primary interfaces of system

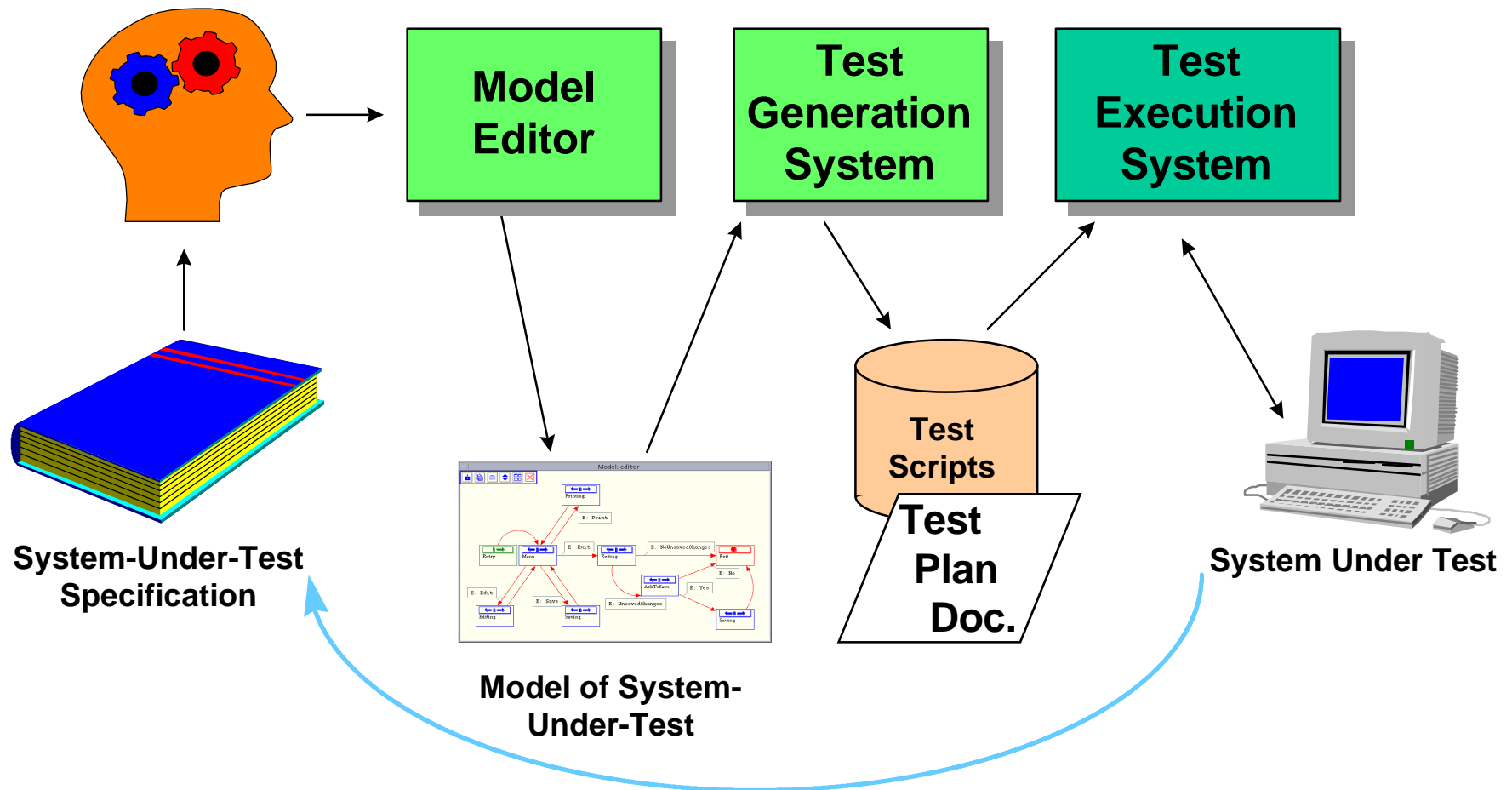**Model becomes repository for use scenarios**

Scenarios can be generated for the specific needs of each stage in the process

Deliverables can be synthesized from model or paths [MSC's, use cases, test plans…]

TERADYNE
Software & Systems Test

A Behavioral Model Facilitates an Integrated Design and Test Process

System Req's

Desired Behavior of System

System Engineering

Add Test Strategy & Execution

REQUIREMENTS

Decompose into Design Structure

Test Engineering

Design Engineering

Generate Test Plan & Scripts

Define Implementation and Code

Verify Actual System Behavior

TERADYNE
Software & Systems Test

A Model Based Incremental Test Development Process

System-Under-Test Specification

Model Editor

Test Generation System

Test Execution System

Model of System-Under-Test

Test Scripts

Test Plan Doc.

System Under Test

TERADYNE
Software & Systems Test

Model Based Test Generation Is More Efficient for Both Design & Test Engineers
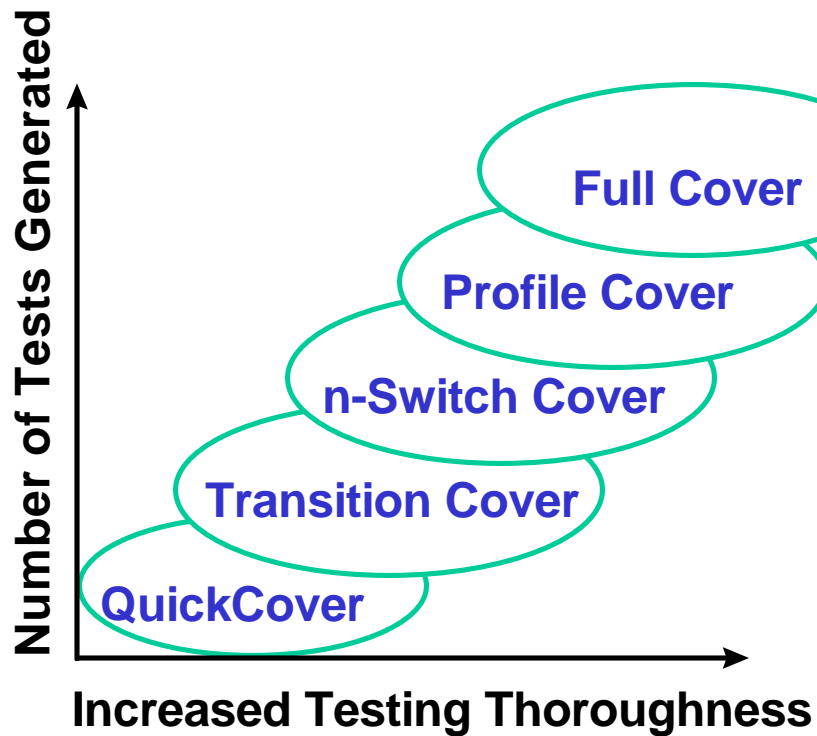
- **<u>No</u> additional information is required for model based approaches**

- **Behavior defined once and <u>permanently</u> captured in model**

- **Models are reused multiple times in the product development process**

- **Models (and Tests) are built incrementally**

- **Process is self-documenting**

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Software & Systems Test

TestMaster Applies Across the Full Breadth of System Development
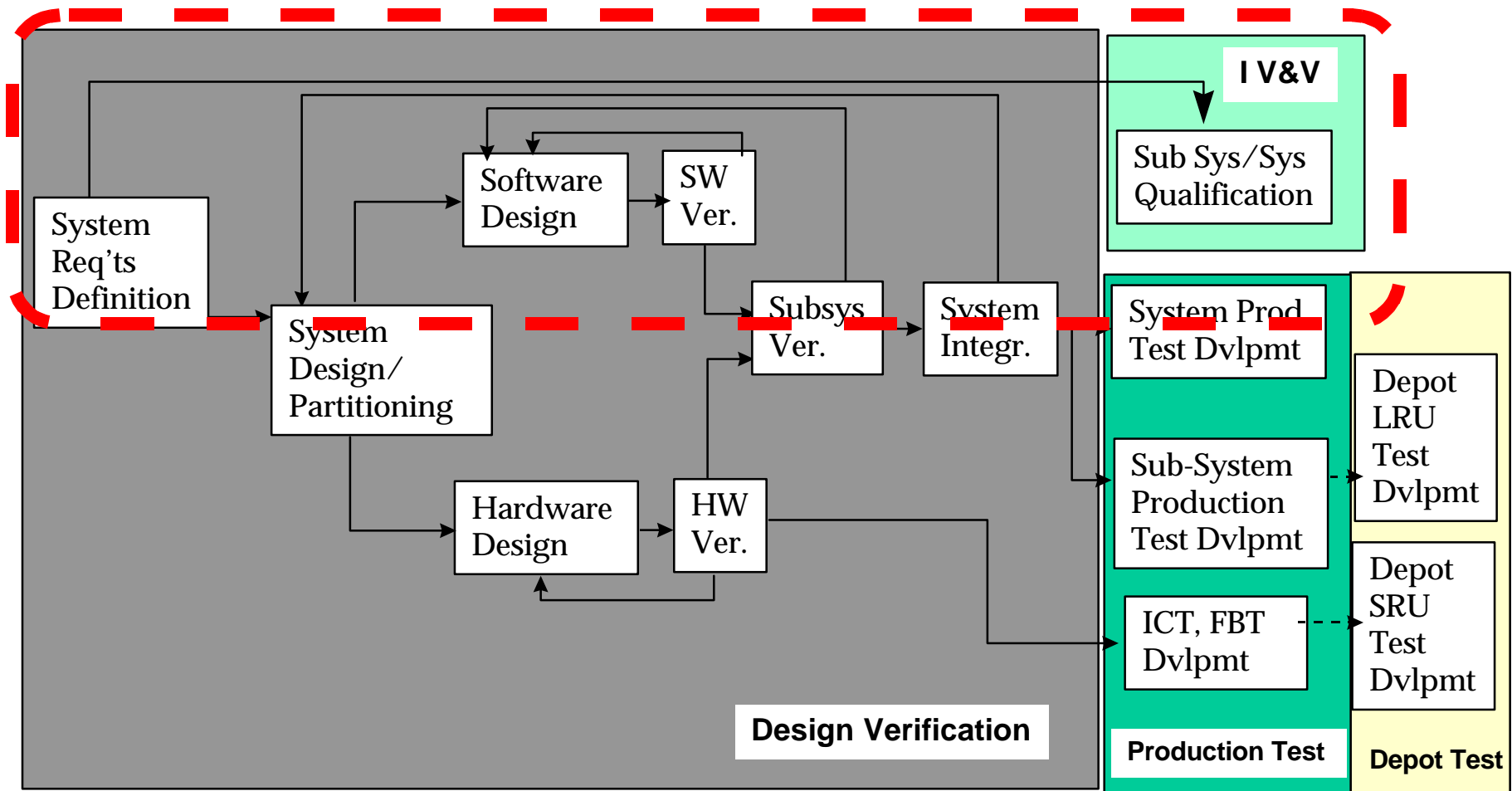
Source: "Transition from Development to Production", DOD R&D publication; Reviews with Raytheon, Boeing

TERADYNE
Software & Systems Test

A Single Model can Create Multiple Test Suites

Number of Tests Generated (vertical axis)

- QuickCover
- Transition Cover
- n-Switch Cover
- Profile Cover
- Full Cover

Increased Testing Thoroughness (horizontal axis)

- Once Captured a Model is a Source of Tests for All Aspects of the Testing Process

- Each Test Generation Algorithm will Create a Suite Targeted at a Particular Goal

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Summary

- **High Reuse, Standard Models**
    - **Incremental Development**
    - **Rapid Response to Change**
    - **High Productivity**

- **Reduced Time to Market @ Known Quality**
    - **Concurrent Design and Test**
    - **Trace-ability to Requirements**
    - **Flexible Test Generation Options**

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